

Lab 18 - Configuring CUBE H.323-to-SIP VoIP Connections

CCNA Voice Lab 18

Configuring CUBE H.323-to-SIP VoIP Connections

Lab Objective:

The objective of this lab exercise is for you to learn and understand how to implement IP-to-IP gateway functionality in Cisco IOS voice gateways

Lab Purpose:

Unlike TDM-to-IP gateways, IP-to-IP gateways have the ability to route between, or connect, two different VoIP calls. This means that on the CUBE, a typical call has two VoIP call legs

Lab Difficulty:

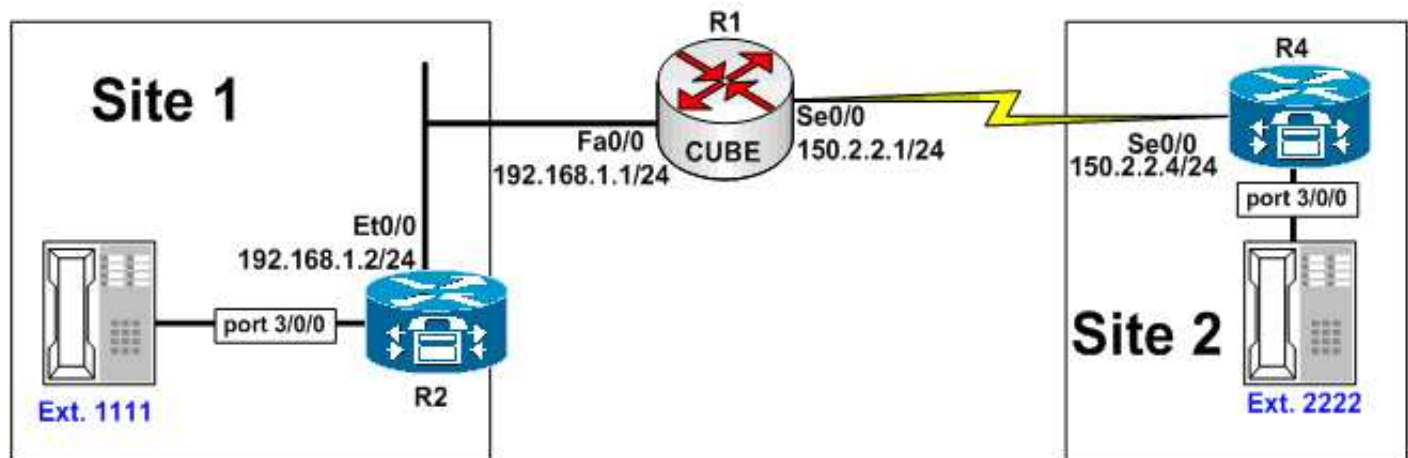
This lab has a difficulty rating of 6/10

Readiness Assessment:

When ready for your exam, you should be able to complete this lab in no more than 10 minutes

Lab Topology:

Please use the following topology to complete this lab exercise:



Lab 18 Configuration Tasks

Task 1:

Configure the hostnames and IP addresses on R1, R2 and R4 as illustrated in the diagram. Configure R4 to provide clocking to R2. Configure the clock rate on R4 as 800Kbps

Task 2:

Configure WAN connectivity between R1 and R4 using the IP addresses specified in the diagram. Configure R4 to provide a clock rate of 800Kbps to R1

Task 3:

Configure IP connectivity between R1 and R2 using the addresses illustrated in the diagram

Task 4:

Configure IP connectivity between R1, R2, and R4 using a routing protocol of your choice

Task 5:

Configure CUBE to allow H.323-to-SIP calls between R2 and R4. Configure the appropriate dial peers based on the extensions illustrated in the diagram

Task 6:

Configure POTS and VoIP dial peers on R2 and R4 as illustrated in the diagram. R4 is a SIP gateway and should be configured to use TCP as the Transport Layer protocol

Task 7:

Configure RFC 2833 DTMF relay for the H.323 and SIP dial peers

Task 8:

Verify your configuration using the appropriate Cisco IOS **show** commands

Lab 18 Configuration and Verification

Task 1:

```
Router(config)#hostname R1
R1(config)#exit
```

```
Router(config)#hostname R2
R2(config)#interface Serial0/0
R2(config-if)#description .Connected To R4 Serial 0/1.
R2(config-if)#ip address 150.1.1.2 255.255.255.0
```

```
Router(config)#hostname R4
R4(config)#interface Serial0/1
R4(config-if)#description .Connected To R2 Serial 0/0
R4(config-if)#ip address 150.1.1.4 255.255.255.0
R4(config-if)#clock rate 800000
```

Verify connectivity by performing a simple ping between the two routers

```
R2#ping 150.1.1.4
```

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 150.1.1.4, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/4 ms
```

```
R4#ping 150.1.1.2
```

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 150.1.1.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/8 ms
```

Task 2:

```
R1(config)#int s0/0
R1(config-if)#description .Connected To R4 Serial 0/0.
R1(config-if)#ip address 150.2.2.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#exit
```

```
R4(config)#int s0/0
R4(config-if)#description .Connected To R1 Serial 0/0.
R4(config-if)#ip address 150.2.2.4 255.255.255.0
R4(config-if)#clock rate 800000
R4(config-if)#no shutdown
```

```
R4(config-if)#exit
```

Verify connectivity by performing a simple ping between the two routers

```
R1#ping 150.2.2.4
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 150.2.2.4, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/4 ms

```
R4#ping 150.2.2.1
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 150.2.2.1, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/8 ms

Task 3:

```
R2(config)#int e0/0
```

```
R2(config-if)#description .Connected To R1.
```

```
R2(config-if)#ip address 192.168.1.2 255.255.255.0
```

```
R2(config-if)#no shutdown
```

```
R1(config)#int f0/0
```

```
R1(config-if)#description .Connected To R2.
```

```
R1(config-if)#ip address 192.168.1.1 255.255.255.0
```

```
R1(config-if)#no shutdown
```

```
R1(config-if)#exit
```

NOTE: If you are using the Howtonetwork.net rack to complete this lab exercise, then you will also need to configure Sw1 as follows:

```
hostname Sw1
```

```
!
```

```
vlan 12
```

```
name R1_R2_VLAN
```

```
!
```

```
interface FastEthernet0/2
```

```
description 'Connected To R1 FastEthernet 0/0'
```

```
switchport mode access
```

```
switchport access vlan 12
```

```
no shutdown
```

```
!
```

```
interface FastEthernet0/3
```

```
description 'Connected To R2 FastEthernet 0/0'
```

```
switchport mode access
```

```
switchport access vlan 12
```

```
no shutdown
```

Task 4:

```
R1(config)#router eigrp 100
```

```
R1(config-router)#no auto-summary
```

```
R1(config-router)#network 0.0.0.0
```

```
R1(config-router)#exit
```

```
R2(config)#router eigrp 100
```

```
R2(config-router)#network 0.0.0.0
```

```
R2(config-router)#no auto-summary
```

```
R2(config-router)#exit
```

```
R4(config)#router eigrp 100
```

```
R4(config-router)#network 0.0.0.0
```

```
R4(config-router)#no auto-summary
```

```
R4(config-router)#exit
```

Verifying connectivity:

Verify EIGRP adjacencies and IP connectivity between the three routers:

R1#**show ip eigrp neighbors**

IP-EIGRP neighbors for process 100

H	Address	Interface (sec)	Hold Uptime (ms)	SRTT Cnt	RTO Num	Q	Seq
1	192.168.1.2	Fa0/0	14 11:56:39	796	4776	0	12
0	150.2.2.4	Se0/0	13 11:56:39	5	200	0	15

R1#

R1#**show ip route eigrp**

150.1.0.0/24 is subnetted, 1 subnets

D 150.1.1.0 [90/2195456] via 192.168.1.2, 11:56:40, FastEthernet0/0

R2#**show ip eigrp neighbors**

IP-EIGRP neighbors for process 100

H	Address	Interface (sec)	Hold Uptime (ms)	SRTT Cnt	RTO Num	Q	Seq
1	192.168.1.1	Et0/0	10 10:54:52	5	200	0	11
0	150.1.1.4	Se0/0	13 10:56:01	6	200	0	14

R2#

R2#**show ip route eigrp**

D 192.168.2.0/24 [90/2195456] via 150.1.1.4, 10:54:53, Serial0/0

150.2.0.0/24 is subnetted, 1 subnets

D 150.2.2.0 [90/2195456] via 192.168.1.1, 10:54:53, Ethernet0/0

R4#**show ip eigrp neighbors**

IP-EIGRP neighbors for process 100

H	Address	Interface (sec)	Hold Uptime (ms)	SRTT Cnt	RTO Num	Q	Seq
2	150.2.2.1	Se0/0	12 10:51:01	23	200	0	10
0	150.1.1.2	Se0/1	14 10:52:10	19	200	0	11

R4#

R4#**show ip route eigrp**

D 192.168.1.0/24 [90/2195456] via 150.2.2.1, 10:51:36, Serial0/0
[90/2195456] via 150.1.1.2, 10:51:36, Serial0/1

Task 5:

R1(config)#**voice service voip**

R1(conf-voi-serv)#**allow-connections h323 to sip**

R1(conf-voi-serv)#**allow-connections sip to h323**

R1(conf-voi-serv)#**exit**

R1(config)#**dial-peer voice 1 voip**

R1(config-dial-peer)#**destination-pattern 1111**

R1(config-dial-peer)#**session target ipv4:192.168.1.2**

R1(config-dial-peer)#**exit**

R1(config)#**dial-peer voice 2 voip**

R1(config-dial-peer)#**destination-pattern 2222**

R1(config-dial-peer)#**session target ipv4:150.2.2.4**

R1(config-dial-peer)#**session protocol sipv2**

R1(config-dial-peer)#**session transport tcp**

R1(config-dial-peer)#**exit**

Task 6:

R2(config)#**dial-peer voice 1 pots**

R2(config-dial-peer)#**destination-pattern 1111**

R2(config-dial-peer)#**port 3/0/0**

R2(config-dial-peer)#**exit**

R2(config)#**dial-peer voice 2 voip**

R2(config-dial-peer)#**destination-pattern 2222**

R2(config-dial-peer)#**session target ipv4:192.168.1.1**

R2(config-dial-peer)#**exit**

R4(config)#**dial-peer voice 1 pots**

R4(config-dial-peer)#**destination-pattern 2222**

```
R4(config-dial-peer)#port 3/0/0
R4(config-dial-peer)#exit
R4(config)#dial-peer voice 2 voip
R4(config-dial-peer)#destination-pattern 1111
R4(config-dial-peer)#session target ipv4:150.2.2.1
R4(config-dial-peer)#session protocol sipv2
R4(config-dial-peer)#session transport tcp
R4(config-dial-peer)#exit
```

Task 7:

```
R1(config)#dial-peer voice 1
R1(config-dial-peer)#dtmf-relay rtp-nte
R1(config-dial-peer)#exit
R1(config)#dial-peer voice 2
R1(config-dial-peer)#dtmf-relay rtp-nte
R1(config-dial-peer)#exit
```

```
R2(config)#dial-peer voice 2
R2(config-dial-peer)#dtmf-relay rtp-nte
R2(config-dial-peer)#exit
```

```
R4(config)#dial-peer voice 2
R4(config-dial-peer)#dtmf-relay rtp-nte
R4(config-dial-peer)#exit
```

Task 8:

First, verify dial peer configuration using the **show dial-peer voice** command:

```
R1#show dial-peer voice 1 | i Voice|Type|type|media|DTMF|dtmf|flow
VoiceOverIpPeer1
```

```
peer type = voice, information type = voice,
numbering Type = 'unknown'
DTMF Relay = enabled,
type = voip, session-target = 'ipv4:192.168.1.2',
ip media DSCP = ef, ip signaling DSCP = af31,
dtmf-relay = rtp-nte,
RTP dynamic payload type values: NTE = 101
Cisco: NSE=100, fax=96, fax-ack=97, dtmf=121, fax-relay=122
RTP comfort noise payload type = 19
Media Setting = flow-through (global)
Max Redirects = 1, signaling-type = cas,
```

```
R1#
```

```
R1#show dial-peer voice 2 | i Voice|Type|type|media|DTMF|dtmf|flow
VoiceOverIpPeer2
```

```
peer type = voice, information type = voice,
numbering Type = 'unknown'
DTMF Relay = enabled,
type = voip, session-target = 'ipv4:150.2.2.4',
ip media DSCP = ef, ip signaling DSCP = af31,
dtmf-relay = rtp-nte,
RTP dynamic payload type values: NTE = 101
Cisco: NSE=100, fax=96, fax-ack=97, dtmf=121, fax-relay=122
RTP comfort noise payload type = 19
Media Setting = flow-through (global)
Max Redirects = 1, signaling-type = cas,
```

```
R2#show dial-peer voice 2 | i Voice|Type|type|media|DTMF|dtmf
VoiceOverIpPeer2
```

```
peer type = voice, information type = voice,
numbering Type = 'unknown'
DTMF Relay = enabled,
type = voip, session-target = 'ipv4:192.168.1.1',
ip media DSCP = ef, ip signaling DSCP = af31,
dtmf-relay = rtp-nte,
```

RTP dynamic payload type values: NTE = 101
Cisco: NSE=100, fax=96, fax-ack=97, dtmf=121, fax-relay=122
RTP comfort noise payload type = 19
Max Redirects = 1, signaling-type = cas,

R4#**show dial-peer voice 2 | i Voice|Type|type|media|DTMF|dtmf**
VoiceOverIpPeer2

peer type = voice, information type = voice,
numbering Type = 'unknown'
DTMF Relay = enabled,
type = voip, session-target = 'ipv4:150.2.2.1',
ip media DSCP = ef, ip signaling DSCP = af31,
dtmf-relay = rtp-nte,
RTP dynamic payload type values: NTE = 101
Cisco: NSE=100, fax=96, fax-ack=97, dtmf=121, fax-relay=122
RTP comfort noise payload type = 19
Max Redirects = 1, signaling-type = cas,

Next, place a call between the extensions in the diagram and verify your configuration:

R1#**show call active voice compact**

<callID>	A/O	FAX	T<sec>	Codec	type	Peer Address	IP R<ip>:<udp>
Total call-legs: 2							
3	ANS	T9		g729r8	VOIP P1111	192.168.1.2:18898	
4	ORG	T9		g729r8	VOIP P2222	150.2.2.4:18996	

R1#

R1#**show voip rtp connections detail**

VoIP RTP active connections :

No.	CallId	dstCallId	LocalRTP	RmtRTP	LocalIP	RemoteIP
1	3	4	17120	18898	192.168.1.1	192.168.1.2
callId 3 (dir=1): called=2222 calling=1111 redirect= dest callId 4: called=2222 calling=1111 redirect= 1 context 83AF6530 xmitFunc 81F62C5C						
2	4	3	19522	18996	150.2.2.1	150.2.2.4
callId 4 (dir=2): called=2222 calling=1111 redirect= dest callId 3: called=2222 calling=1111 redirect= 1 context 83AF6F70 xmitFunc 81F62C5C						
Found 2 active RTP connections						

R2#**show call active voice compact**

<callID>	A/O	FAX	T<sec>	Codec	type	Peer Address	IP R<ip>:<udp>
Total call-legs: 2							
5	ANS	T53		g729r8	TELE P1111		
6	ORG	T53		g729r8	VOIP P2222	192.168.1.1:17120	

R2#

R2#**show voip rtp connections detail**

VoIP RTP active connections :

No.	CallId	dstCallId	LocalRTP	RmtRTP	LocalIP	RemoteIP
1	6	5	18898	17120	192.168.1.2	192.168.1.1
callId 6 (dir=2): called=2222 calling=1111 redirect= dest callId 5: called= calling=1111 redirect= 1 context 64ED6484 xmitFunc 620406E4						
Found 1 active RTP connections						

R4#**show call active voice compact**

<callID>	A/O	FAX	T<sec>	Codec	type	Peer Address	IP R<ip>:<udp>
Total call-legs: 2							
3	ANS	T87		g729r8	VOIP P1111	150.2.2.1:19522	
4	ORG	T87		g729r8	TELE P2222		

R4#

R4#**show voip rtp connections detail**

VoIP RTP active connections :

No.	CallId	dstCallId	LocalRTP	RmtRTP	LocalIP	RemoteIP
-----	--------	-----------	----------	--------	---------	----------

1 3 4 18996 19522 150.2.2.4 150.2.2.1

callId 3 (dir=1): called=2222 calling=1111 redirect=
dest callId 4: called=2222 calling=1111 redirect=
1 context 64F22ACC xmitFunc 620406E4
Found 1 active RTP connections

R4#

R4#**show sip-ua calls**

SIP UAC CALL INFO

Number of SIP User Agent Client(UAC) calls: 0

SIP UAS CALL INFO

Call 1

SIP Call ID : 77DB7AB4-2C0111D6-8002D6A0-DE808D61@150.2.2.1

State of the call : STATE_ACTIVE (7)

Substate of the call : SUBSTATE_NONE (0)

Calling Number : 1111

Called Number : 2222

Bit Flags : 0x1212003E 0x100000 0x488

CC Call ID : 3

Source IP Address (Sig) : 150.2.2.4

Destn SIP Req Addr:Port : 150.2.2.1:5060

Destn SIP Resp Addr:Port: 150.2.2.1:39018

Destination Name : 150.2.2.1

Number of Media Streams : 1

Number of Active Streams: 1

RTP Fork Object : 0x0

Media Stream 1

State of the stream : STREAM_ACTIVE

Stream Call ID : 3

Stream Type : voice+dtmf (1)

Negotiated Codec : g729r8 (20 bytes)

Codec Payload Type : 18

Negotiated Dtmf-relay : rtp-nte

Dtmf-relay Payload Type : 101

Media Source IP Addr:Port: 150.2.2.4:18996

Media Dest IP Addr:Port : 150.2.2.1:19522

Orig Media Dest IP Addr:Port : 0.0.0.0:0

Number of SIP User Agent Server(UAS) calls: 1

Final Relevant Configuration R1:

R1#**show running-config**

Building configuration...

Current configuration : 1948 bytes

!

version 12.4

service timestamps debug datetime msec

service timestamps log datetime msec

no service password-encryption

!

hostname R1

!

!

!

!

voice service voip

allow-connections h323 to sip

allow-connections sip to h323

!

!

!

```

!
interface FastEthernet0/0
  description .Connected To Switch 1 FastEthernet 0/2.
  ip address 192.168.1.1 255.255.255.0
  duplex auto
  speed auto
!
interface Serial0/0
  description .Connected To R4 Serial 0/0.
  ip address 150.2.2.1 255.255.255.0
!
router eigrp 100
  network 0.0.0.0
  no auto-summary
!
!
!
!
dial-peer voice 1 voip
  destination-pattern 1111
  session target ipv4:192.168.1.2
  dtmf-relay rtp-nte
!
dial-peer voice 2 voip
  destination-pattern 2222
  session protocol sipv2
  session target ipv4:150.2.2.4
  session transport tcp
  dtmf-relay rtp-nte

```

Final Relevant Configuration R2:

R2#**show running-config**

Building configuration...

Current configuration : 1476 bytes

```

!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname R2
!
!
!
!
interface Ethernet0/0
  description .Connected To Switch 1 FastEthernet 0/3.
  ip address 192.168.1.2 255.255.255.0
!
!
!
!
router eigrp 100
  network 0.0.0.0
  no auto-summary
!
!
!
!
voice-port 3/0/0
!
voice-port 3/0/1
!
voice-port 3/1/0
,

```



```
!  
voice-port 3/1/1  
!  
!  
!  
!  
dial-peer voice 1 pots  
destination-pattern 1111  
port 3/0/0  
!  
dial-peer voice 2 voip  
destination-pattern 2222  
session target ipv4:192.168.1.1  
dtmf-relay rtp-nte
```

Final Relevant Configuration R4:

R4#**show running-config**

Building configuration...

Current configuration : 1516 bytes

```
!  
version 12.4  
service timestamps debug datetime msec  
service timestamps log datetime msec  
no service password-encryption  
!  
hostname R4  
!  
!  
!  
interface Serial0/0  
description .Connected To R1 Serial 0/0.  
ip address 150.2.2.4 255.255.255.0  
clock rate 800000  
!  
!  
router eigrp 100  
network 0.0.0.0  
no auto-summary  
!  
!  
!  
!  
voice-port 3/0/0  
!  
voice-port 3/0/1  
!  
voice-port 3/1/0  
!  
voice-port 3/1/1  
!  
!  
!  
!  
dial-peer voice 1 pots  
destination-pattern 2222  
port 3/0/0  
!  
dial-peer voice 2 voip  
destination-pattern 1111  
session protocol sipv2  
session target ipv4:150.2.2.1  
session transport tcp  
dtmf-relay rtp-nte
```



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